

put the monetary loss of Lorain at \$11,000,000. The loss of life, including the deaths later from injuries, was 73, 8 of these being killed in the bathhouse and 15 in the State Theater. However, 39 names remain on the list of missing at this writing. About 200 were enough injured to need surgical treatment.

Three photographs of the damaged buildings and the wreckage in the streets of Lorain are reproduced; they were obtained through the courtesy of the Cleveland Daily News and the Chicago Herald and Examiner, respectively.

Regarding the effect of the terrific wind on structures, Mr. Emery states:

There were examples of buildings destroyed and those adjoining receiving little or no damage. Many wrecked buildings had their walls blown in and others their walls blown out. Most of the business blocks wrecked were not of modern construction. The Antlers Hotel, of steel construction, directly in the path of the storm, was not harmed beyond having one corner of its roof damaged.

The tornado settled down again at Sheffield, 5 miles from Lorain, and again at Avon, about 3 miles still farther east, and once more at West Dover, 4 miles beyond. The last-named place is just east of the western limit of Cuyahoga County, but 14 miles from Cleveland. There was damage at each of these places, and press reports state that three deaths occurred at Avon and one at West Dover.

There were high winds over much of Ohio that afternoon and evening, but the information at hand does not clearly indicate any tornado other than the one just outlined. In the northwestern part of Pennsylvania, however, there seems to have been a true tornado near Meadville, in which five lives were lost. The place is so far east of Cuyahoga County, Ohio, and the hour stated (6 p. m.) is so early that this is not considered a reappearance of the Ohio tornado.

Heavy rains, over a period of several hours, marked the weather of northern Ohio that afternoon and evening, and floods sufficient to cause considerable damage occurred in many of the small streams.

The area experiencing high winds in connection with the eastward movement of the LOW extended from the

eastern portions of Nebraska and South Dakota, where the strongest winds came at a late hour of the 27th, to west-central New York, where the wind was highest usually after noon of the 29th. There were hailstorms in a few portions of this area, and in portions of Iowa, Illinois, and western Pennsylvania, as well as northern Ohio, some districts had downpours sufficient to cause washouts.

The LOW, which is designated X on Chart II of this REVIEW, was central in Nebraska at the evening observation of the 27th, with sea-level reading of 29.52 inches at Valentine; in northeastern Iowa on the morning of the 28th, readings 29.54 inches at Charles City and La Crosse; in lower Michigan the next evening, reading 29.54 inches at Detroit; and near Parry Sound, Ontario, the morning of the 29th, reading 29.36 inches.

The early press reports of the disaster indicated that the losses of life and property at Lorain were so great that the damage greatly and the deaths probably exceeded any previous record of a single tornado; that the damage might equal that at Galveston, Tex., in the hurricane of September, 1900, a storm of quite different type. These early estimates fortunately proved much worse than the truth, though the whole track of the tornado shows 83 deaths and \$13,000,000 damage.

Yet \$13,000,000 far exceeds the property loss of any tornado for many years back, and, indeed, but two recent years have shown a greater aggregate tornado loss of the whole country during an entire year—1920, with somewhat more than \$15,000,000, and 1917, with about \$14,500,000. The St. Louis tornado of May 27, 1896, caused damage of about \$12,900,000; but the increase which has since occurred in the value of buildings should be remarked.

Regarding great losses of life, the southern tornado in South Carolina, on April 30 of this year, cost 67; no other tornado has killed so many since April 20, 1920, when one in Mississippi and Alabama cost 87. North of the Ohio River no record nearly so great is found since the 103 of the long tornado of May 26, 1917, which was especially destructive at Mattoon and Charleston, Ill. The loss of life in the St. Louis tornado was 306.

THE SOUTHERN MARYLAND WINDSTORM OF JUNE 8, 1924

551.515 (752)

By B. FRANCIS DASHIELL

On the afternoon of Sunday, June 8, 1924, a windstorm of unprecedented severity passed rapidly over southern Maryland and within a few minutes had caused damage which is conservatively estimated at \$650,000. Ordinarily the section referred to is pleasantly free from severe windstorms, and the residents do not recall any storms which even approximate the one of June 8 in such widespread devastation.

The wind, from all appearances, was a straight blow, but a few tornadic effects are indicated at some places. The writer while making a visit to the sections which experienced the storm was unable to obtain any reports as to whether there were clouds having the aspect of a tornado. The wide path in which the storm passed would also indicate a straight blow. Each person interviewed gave a similar report relative to the characteristics of the clouds, and the following description may be said to be a composite description of the cloud appearance before and during the storm. Many people, as well as two Weather Bureau cooperative observers, state

that the cloud was the swiftest moving cloud that they had ever observed. Previous to the approach of the storm the sky to the southwest and west took on a yellowish-red lurid glare and was accompanied by a steady roar of thunder, which increased rapidly in intensity as the dark clouds covered the sky. This darkness was not experienced in all localities, but in Washington for a few minutes the darkness was great enough to compel motorists to put on their lights. One cooperative observer stated that the cloud took on the appearance of a flat blanket and rolled at the advancing edge. The red and lurid glare seems to have predominated, as no one who saw the advance of the storm failed to mention this feature. The speed with which the storm advanced may be estimated from the fact that in some cases it was well in progress before windows could be closed.

The wind direction was first southwest and immediately reached a very high velocity, but within a few minutes it suddenly shifted to the northwest and with increased intensity. The velocity can not be estimated,

as there are no stations equipped with the necessary apparatus within the section, but at the central office of the Weather Bureau at Washington, which was considerably out of the path of the storm, a wind velocity of 36 miles was recorded at 3 p. m.

At this same time the barometric pressure was 29.87 inches, which rose rapidly to 29.96 within 15 minutes, but fell to 29.86 inches at 4 p. m.

Within a period of less than 15 minutes the wind had fallen and a perfect calm prevailed, with a clearing sky. The rainfall at three cooperating stations—Cheltenham, La Plata, and Ferry Landing—was 0.38, 0.34, and 0.19 inches, respectively, and during the night there were about 2 inches of additional rainfall. Hail also was quite general over the area, some places east of Washington reporting stones as large as walnuts. A light hail fell in Washington at the beginning of the storm.

In St. Marys and Charles Counties the most destructive wind was from the northwest, while in Prince Georges County the wind was most severe from the southwest. In Calvert County, on the east side of the Patuxent River, the writer found that both the southeast and northwest winds did about equal damage. In some localities large trees were twisted off and scattered in all directions, which would possibly indicate tornadic action; but otherwise the storm as a whole was a straight-line blow.

At Cheltenham an entire piece of virgin forest, consisting of large oaks of several feet in diameter, was completely blown down. At the same place a church was completely moved from its foundations while filled with people. Very few homes were destroyed, most of the damage being confined to porches and roofs, but trees, many of them a century old, around practically every house in the path of the storm were uprooted.

Tobacco barns met with destruction throughout the area, and this is the direct cause of the high monetary losses, as practically every barn was partially filled with cured tobacco awaiting shipment.

In Calvert County there were 64 tobacco barns destroyed, with a loss of over \$60,000 for the buildings alone, as no tornado insurance is carried in that part of the East. The loss of cured tobacco will probably amount to \$100,000 in this county. In Prince Georges County approximately 80 barns were destroyed, with a loss of over \$200,000, while in St. Marys and Charles Counties over 50 barns and contents were destroyed, with a loss of \$150,000. The loss of orchards, fruit, stock, fences, timber, etc., will approximate \$100,000.

RECORD CLOUDBURST FLOOD IN CARTER COUNTY, TENN., JUNE 13, 1924

551.577.3 (768)

By WARREN R. KING, District Engineer, U. S. Geological Survey

One of the most terrific rainstorms ever recorded in eastern Tennessee descended upon the small mountain villages of Cardens Bluff, Siam, and Hunter and the surrounding region in Carter County during the night of June 13, 1924. This torrential cloudburst caused the loss of 11 lives, severely injured several persons, and damaged property to the extent of more than half a million dollars. The scene of the disaster lies just east of Elizabethton, along Watauga River, about 20 miles east of Johnson City.

The greatest devastation was wrought in a nearly oval area containing about 50 square miles, the major axis of which extends from northwest to southeast between Hunter and Cardens Bluff. Within this area roads and highways were rendered impassable, many sections being completely washed out and bridges destroyed; houses were swept away; and hundreds of acres of farm land

In many cases entire orchards were uprooted, the writer having seen one with the trees blown over in rows with perfect precision. Hundreds of telephone poles were down, and the mass of trees, branches, poles, and wire made public roads impassable for several days. The loss to public-service companies will run into many thousands of dollars.

At Chesapeake Beach, a summer resort on the east side of the bay, in Calvert County, which was crowded with patrons, considerable damage was done by the destruction of cottages, piers, and boardwalk. Falling trees and limbs wrecked a large number of parked automobiles and endangered the lives of the occupants. A number of lives, estimated to be about 10, were lost, mostly when boating parties on the Potomac, Patuxent, and Chesapeake were caught in the storm.

A church, located in a deep valley and surrounded by high wooded hills and filled with colored worshippers, was lifted into the air and dropped some distance from its foundations, demolishing the plastering and windows, while at the same time a horse and buggy standing near the door were blown over a fence into a creek.

One peculiarity of the storm was that the level country bordering the Patuxent River, on the west and east, was singularly free from damage, while the sections back from the river received the entire brunt of the storm. The water on the eastern side of the Patuxent River, which is over one-half mile wide at this point, was backed up so that it overflowed and washed away the surfacing from a road which parallels the river.

At one place the writer noticed a barn which had been blown down by the southwest wind and a scant quarter of a mile off to the east another barn blown down by a northwest wind. A large oak tree was uprooted but a few feet from the door of a public-school house, while smaller trees in the rear of the building were untouched, not even having branches broken off. Reports of streaks of severe wind velocities of this kind were very common.

This storm, covering much of the tobacco belt of southern Maryland, strikes a severe blow to the farmers who raise only tobacco of the famous Maryland type. The loss of over one-half of the great barns in this section will prevent many farmers from growing tobacco this season, as it will be impossible to reconstruct the buildings for the housing of the 1924 crops, which begins with August 1.

were covered with rock and débris. The mountain division of the Southern Railway, which runs parallel to Watauga River throughout this area, suffered heavy damage. In at least 50 places the track was either swept into the river or was covered with 1 to 5 feet of earth and rock, and many bridges and trestles were washed away. The railroad officials detailed more than 500 men to clear up the wreckage and rebuild the track, and within 6 days after the storm trains were again running on schedule time.

Owing to the comparatively small size of the area covered by the storm, there was no extreme flood on either Watauga River or Doe River, whose channels were more than adequate to carry the flood water, and the bulk of the damage came from floods on small tributaries and from hillside wash.